

# Exploring Children's Experiences Following Sport-Related Concussions: Identifying and Overcoming Emotional Challenges and Adversity Following Traumatic Brain Injury (TBI)

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## Abstract

**Objectives:** To gain a better understanding of the emotional and mental experiences of child and adolescent athletes following a sport-related concussion, in order to better support these athletes throughout recovery.

**Methods:** Adolescents ( $n=21$ ) ages 15-24 years who self-reported experiencing a sport-related concussion under the age of 18, participated in a retrospective, single group, qualitative analysis based on semi-structured interviews. Thematic Content Analysis was used to identify themes amongst participants' responses.

**Results:** The results indicated three overarching domains with underlying themes and subthemes within: (1) Acute Challenges Post-Concussion (i.e., difficulty accepting unknowns, self-image and mattering, school, missing out and isolation, feelings of hopelessness), (2) Coping with Acute Challenges Post-Concussion (i.e., support, previous concussions, prioritizing mental health), and (3) Take-Aways Post-Concussion (i.e., learning about injury, self-growth, long lasting impacts on overall health).

**Conclusion:** Child and adolescent athletes face numerous emotional challenges post-concussion and following recovery; however, there are many ways in which children are resilient and cope with these challenges.

**Implications:** It is critical that the knowledge of child and adolescent athletes' challenges post-concussion, as well as the successful coping mechanisms and protective factors utilized throughout recovery are used to develop better preventative and interventive strategies, in order to support the athletes' well-being post-concussion.

**Keywords:** Mental health, sport-related concussions, challenges, protective factors, resiliency.

## Introduction

Traumatic Brain Injury (TBI) represents a major public health problem and is a leading cause of hospitalization and death among children and adolescents (Langlois et al., 2006). Concussion is the term most often used to describe a Mild Traumatic Brain Injury (mTBI) suffered through sport, also known as a sport-related concussion (SRC; Mrazik et al., 2016). SRCs are induced by a direct blow to the head, face, neck or anywhere in the body where the blow could be transmitted to the head (McCrory et al., 2017). An estimated 2.5 million SRCs occur each year in high school students across the United States (DePadilla et al., 2018).

The most recent consensus statement on SRCs have called for more research exploring the emotional challenges and experiences that may accompany SRCs (McCrory et al., 2013). Emotional responses seen in athletes following brain injury differ from their response to other musculoskeletal injuries (Hutchison et al., 2009). For example, when assessing mental health post-concussion, if the concussion symptoms last longer than 3 months, they can significantly impact the child's daily life and can intensify emotional or depressive symptoms (Duffy, 2012). Common psychological outcomes following TBI in children and adolescents are anxiety disorders, mood disorders (Hawley, 2003; Kirkwood et al., 2008; Max et al., 2011, 2013), ADHD (Schachar et al., 2015), and an increased risk of developing PTSD (Schachar et al., 2015). Therefore, it is critical that sport-medicine professionals assess and monitor emotional reactions in addition to other somatic and neurocognitive outcomes throughout recovery (Hutchison et al., 2009).

More recently, research has provided a better understanding of SRCs and their adverse health consequences (Costello et al., 2018). In a qualitative study by Cover et al. (2018), retired collegiate athletes spoke about previous concussions and described multiple emotional, physical, cognitive, and social challenges post-concussion. Athletes connected their perception of concussion severity to indifference, change in perspective over time and athletic identity. Engström et al. (2020), and Todd et al. (2018), also noted difficulty with rebuilding self-identities in hockey players who experienced SRCs.

In recent qualitative studies, it has been found that the majority of children's anxiety and stress post-concussion is related to social and academic experiences (Davies et al., 2020; Valovich McLeod et al., 2017). Children also noted emotional challenges, more specifically, intense emotional reactions to their injury and their family's reaction to their injury, including sadness, anxiety and guilt (Davies et al., 2020), as well as personal emotions such as being irritable and easily frustrated (Valovich McLeod et al., 2017).

Because an SRC can cause many mental and physical challenges for athletes throughout recovery, it can be viewed as an adverse event. Despite negative outcomes post-concussion, there is an opportunity for athletes to overcome adversity through portraying resilience. An individual who is successful despite facing adversity is described as resilient (Brooks, 2006). Someone who is resilient possesses certain strengths and benefits from protective factors, which help them overcome adverse scenarios (Alvord & Grados, 2005; Brooks, 2006; Masten, 2007, 2011; Masten et al., 1990; Masten & Coatsworth, 1998; Rak & Patterson, 1996; Werner, 1986). Protective factors such as positive social support through family, friends, teammates, athletic trainers, coaches, and physicians can decrease distress following injury (Covassin et al., 2014; Weber Rawlins et al., 2021). Previous studies have found an association between resilience and concussion recovery (Durish et al., 2019), and post-concussive symptoms (Bunt et al., 2021), such that lower levels of resilience are associated with increased symptom number and severity in adolescents.

The investigation of children and adolescents' experiences post-concussion is an emerging area of research and, therefore, uncertainty exists amongst medical practitioners and sport administrators about how to manage SRC's and how to support children through a full recovery post-concussion (Harmon et al., 2013). Research is needed to further investigate barriers (Cover et al., 2018) and protective factors, but also to explore the strengths and responses that improve mental health recovery post-concussion.

## Current Study

As a result of the large number of children and adolescents who experience concussions every year and the link with an increased risk of developing a psychiatric disorder, the current study aimed to further the research in this area by examining how children and adolescents respond emotionally and mentally following an SRC. This will allow for the identification of common adverse experiences throughout recovery, as well as potential protective factors and other mechanisms of resilience.

## Method

### Approach

Researchers took a post-positivism approach to the analysis. Post-positivism is the most dominant paradigm in sports- psychology (Poucher et al., 2020), where researchers focus on probability and seek to approximate the truth, rather than attempting to entirely grasp it in its essence (Crotty, 1998).

Inter-rater agreement was assessed in the study and a high level of agreement was achieved; therefore, the results are deemed reliable (Smith, 2018). By portraying athletes' experiences and testimonies, the results of the study allow for transferability (Tracy, 2010), and naturalistic generalizability (Stake, 1978, 1995). Additionally, these findings may apply to adolescents who experience other injuries and forms of adversity (COVID-19, etc.) and, therefore, the results may allow for analytical generalization (Chenail, 2010; Polit & Beck, 2010; Ritchie et al., 2003; Simons, 2014).

### Participants

Individuals interested in participating in the study were recruited from the community in the Greater Toronto Area and Kitchener-Waterloo region, in Ontario, Canada. Recruitment was done using convenience sampling, and information about the study was spread through a snowball effect within the community. No compensation for participation was provided. Consent was obtained from participants and their parents (if under the age of 18) through an online secure survey host, Survey Wizard (see <https://surveys.oise.utoronto.ca/surveywizard2/>). Twenty-one individuals ages 15- 24 years ( $M= 19.76$  years,  $SD= 2.68$  years, 43% male, 57% female) contacted the researcher in order to participate in the study (see Table 1). Each participant self-identified as experiencing a sport-related concussion under the age of 18. This experimentation has been reviewed by the University of Toronto Ethics Review Board.

**Table 1.** Demographic Data

Participant Age	Months Since Concussion	Gender	Sport	Previous Concussions	Total Number of Concussions
15	6	Female	Hockey	Yes	4
16	32	Male	Football	No	1
16	50	Male	Football	No	1
17	5	Female	Hockey	Yes	3
17	Data not provided	Female	Horseback Riding	Yes	2
17	19	Female	Horseback Riding	Yes	3
18	7	Female	Basketball	Yes	4
19	53	Female	Volleyball	Yes	3
19	22	Male	Wakeboarding	Yes	2
20	40	Male	Rock Climbing	No	1
20	14	Male	Lacrosse	Yes	3
20	42	Female	Hockey	No	1
21	77	Female	Hockey	Yes	2
22	Data not provided	Male	Basketball	Yes	2 or 3
22	96	Male	Football	No	1
22	72	Female	Basketball and Slow Pitch	Yes	11
22	77	Male	Hockey	Yes	4
22	112	Male	Hockey	Yes	2
23	63	Female	Bubble Soccer	No	1
23	112	Female	Hockey	Yes	3
24	156	Female	Downhill Skiing	No	1
<b><math>M = 19.8</math></b>	<b><math>M = 55.5</math> months/4.8 years</b>	<b>Males = 9 (43%)</b>		<b>Yes = 14 (67%)</b>	

## Data Collection

Semi-structured interviews were conducted with participants, by one researcher who met with each participant individually. When deciding to use a semi-structured interview, it was important to note that information obtained from free recall, or an unstructured interview schedule, is more likely to capture the unique perspective of the child or adolescent, as opposed to receiving responses to questions posed from the perspective of the adult (Engel, 1995; Faux et al., 1988). The researcher who conducted the interviews had previously taken a Qualitative Research Methods course.

The semi-structured interview was conducted over the telephone and allowed for participants to tell the story of their injury along with different thoughts, feelings, and emotions they experienced at the time of their injury, and throughout their recovery. The interview questions (see Figure 1) were developed by the research team based on key concepts and ideas. The general question was presented to participants and prompts were used, if necessary, to evoke a response if a participant struggled to verbally articulate their experience. If participants had experienced multiple concussions, they were asked to speak about their most recent injury. The interviews were audio recorded and then transcribed by volunteers.

**Figure 1.** Interview Guideline/Script

### Qualitative Interview Questions

#### **Child**

**General Question:** Can you tell me the story about when you got your concussion and how you recovered? While you are telling the story can you try to talk about your feelings, thoughts and emotions?

#### **Prompts: If needed to get more information**

1. How did you feel when you were told that you weren't able to play (insert sport they play)?
  - a. Have those feelings changed since then?
2. How did it make you feel when your head was hurting, and you couldn't do all the activities you usually do?
3. Your self-image is what you think of yourself and it may be affected by many things such as how you are feeling, what others think of you and how they treat you. How did you think about yourself when you were injured?
  - a. Do you still think this way about yourself? Was there a time when those thoughts changed?
4. How did your teammates/ family/ friends react when you got hurt? How have they treated you since then? How does this make you feel?
5. Do you think this injury has taught you anything about yourself outside of (the sport they play)?
  - Has it changed how others treat you? If so, how does this make you feel?

## Data Analysis

Inductive thematic content analysis (TCA) was used to analyze the qualitative data. TCA can be defined as a method for identifying, analyzing, and reporting patterns and themes in the data (Braun & Clarke, 2006). A theme captures something important in the data that is relevant to the research question, and must also present some level of patterned response or meaning in the overall data set (Braun & Clark, 2006). There are four phases of TCA: Phase 1 involves becoming familiar with the data which involves collecting data, transcribing it, and finding patterns within the data; Phase 2 is the generation of initial codes; Phase 3 involves searching for themes within the data by going through the different codes and looking for broader themes; and Phase 4 is reviewing themes, which involves going through each theme and refining them (Braun & Clarke, 2006).

The identification of themes was completely driven by the data, and there were no a priori expectations of what would be found. TCA at the latent level was used for data analysis. To ensure reliability and avoid bias, triadic coding was used to analyze the transcribed interviews. The researcher who conducted the interviews, as well as two blind coders, independently coded the data. Meetings were arranged over Zoom (see <https://zoom.us>), an online video platform, to read through the transcriptions, as a group, and to identify codes. Once all transcripts were coded, the data was analyzed to look at overall themes based on the frequency and importance of individual codes. From there, themes were grouped into larger domains. Any discrepancies in the overall themes were discussed, and a final conclusion was reached. Themes and domains were named by the three coders, based on the identification of a connection amongst the most frequent and important codes.

## Results

Three overarching domains were revealed: (a) Acute Challenges Post-Concussion, (b) Coping with Acute Challenges Post-Concussion, and (c) Take-Aways Post-Concussion.

### Domain 1: Acute Challenges Post-Concussion

Participants discussed the impact of various recovery challenges and adversities on their physical and mental health (see Table 2).

**Difficulty with unknowns throughout recovery.** Approximately half of the participants expressed challenges coping with the unknowns involved with concussion recovery, including the unpredictable severity of symptoms, rate of progress, and development of novel feelings and symptoms:

*I think it was just, kind of what I alluded to, the uncertainty of it. Like one day you wake up and you feel good, or it could even be half a day where you wake up and feel good and then something just clicks and it goes downhill from there. And it really wasn't dependent on anything I was doing, in terms of, it's not like I was staying up late playing video games or watching TV, that would have probably had an obvious effect on me. It was kind of just, it was so random that it was super frustrating and discouraging I'd say (Participant #20).*

*So, it was very new, and very confusing, and really just very frustrating, because I had no idea how to cope with all the things I was feeling and all the symptoms (Participant #4).*

**Impact on self-image and mattering.** The majority of athletes talked about the impact that the concussion and recovery process had on their self-image and/or perception of how much they mattered to others and themselves. Fifty-two percent of participants reported an immediate change in their self-image following their concussion and 24% of participants reported a long-lasting impact. One participant noted: "After my third one, I didn't like the way I looked or how I felt as a person after it (Participant #18)".

Half of the participants spoke about the impact that mattering had on their recovery whether it be in a negative or positive form:

*I felt like I didn't really belong in a place, at the time, and I'm not sure that it wasn't a depression state at the time. I was still young, and I didn't know anything about that, so I don't know if I was depressed or not at the time. But it was definitely... feelings like that because all my friends were at the rink and I wouldn't see them after school, because they had to go to hockey. And I kind of isolated myself from them, because I felt like I wasn't a part of that group anymore, so. That was the hard part that I kinda felt like I didn't belong, and kinda felt like I had to... reinvent myself (Participant #7).*

Twenty-four percent of individuals spoke about feeling like they no longer had a purpose in life after their injury. Those who experienced a negative impact on their recovery, due to feelings of not mattering to others, struggled with the emotional aspect of their recovery.

**Challenges with school.** Just under half of the participants reported that the return to school was emotionally challenging as a result of the stress/anxiety associated with falling behind, and potentially receiving poor grades. Participants reported challenges related to difficulty concentrating and completing assigned work. One participant noted: "Especially how I was doing in school, I felt bad. Probably that's the biggest toll, because I couldn't do everything I wanted to (Participant #6)".

**Missing out and feelings of isolation.** Participants frequently discussed feelings of frustration related to missing out on aspects of sport (62%) or other activities they were typically involved in (71%). Sixty-two percent of participants described feelings of isolation throughout their recovery process, many of these individuals using the term “lonely” to describe their feelings. This appeared to be one of the greatest mental health challenges for participants.

**Feelings of hopelessness and helplessness.** Participants often mentioned feelings of hopelessness and helplessness as they progressed through their recovery. Some participants talked about lack of motivation throughout recovery or “not caring” about certain aspects of their life:

*I was just wasting my life and I felt like things were hopeless and things would never get better and I didn't see the light at the end of the tunnel (Participant #19).*

*Sometimes I just didn't even care if I was getting better or not (Participant #9).*

One third of participants in the study mentioned feeling not understood by those around them:

*It certainly was frustrating, because lots of kids in my class and my friends didn't really understand what a concussion was. So, they thought I was being dramatic, or I was faking it. And that stigma really made me feel, just even more upset, because they had no idea what I was feeling (Participant #14).*

*The problem with concussions is that it's not a visible wound, it's like a mental illness. It's something that you can only explain to people and they can only understand it if they've been through it. So, the vast majority of people, they just don't get it (Participant #19).*

**Table 2.** Frequency Chart Domain 1: Acute Challenges Post-Concussion

Acute Challenges Post-Concussion	Participants who Spoke about Theme		Overall Number of Times Theme was Mentioned
	Number (n)	Percentage (%)	
<b>Difficulty with Unknowns Throughout Recovery</b>	11	52%	35
Frustration due to Novel Feelings and Symptoms	5	24%	12
Unpredictability of Symptoms	5	24%	8
Frustration due to Lack of Ability to see Progress	5	24%	6
Fear of Unknown	4	19%	6
Difficulty Accepting all Unknowns	2	9%	3
<b>Impact on Self-Image and Mattering</b>	21	100%	73
Change in Self-Image Post-Concussion	11	52%	19
Negative Impact of Mattering on Recovery	7	33%	14
No Change in Self-Image Post-Concussion	7	33%	9
Comparison to the Experience of Others	6	29%	9
Positive Impact of Mattering on Recovery	5	24%	6
Self-Reported Change in how others Perceive/Treat them	5	24%	6
Long-Lasting Impact of Self-Image	5	24%	5
Personal Choice to Self-Isolate	3	14%	5
<b>Challenges with School</b>	9	43%	24
Increased Distress Regarding Academics	7	33%	13
Difficulty Concentrating	4	19%	7
Difficulty Completing School Work	3	14%	4
<b>Missing Out and Feelings of Isolation</b>	18	86%	105
Frustration due to Missing Out on Typical Activities	15	71%	30
Frustration about Sport	13	62%	33
<i>Frustration due to Missing Out on being an Athlete</i>	12	57%	25
<i>Frustration due to Inability to Contribute to Sport as a Team Player</i>	6	29%	8
Feelings of Isolation	13	62%	27
Boredom due to Isolation	5	24%	6
Stress about Losing Athletic Ability Compared to Teammates	3	14%	3
Sadness about Missing Out	3	14%	6
<b>Feelings of Hopelessness and Helplessness</b>	16	76%	53
Hopelessness/Helplessness	12	57%	20
General Sadness throughout Recovery	8	38%	14
Feeling Not Understood	7	33%	19

## Domain 2: Coping with Acute Challenges Post-Concussion

Participants described aspects of their recovery that helped to make the process easier on them, which are also referred to as protective factors (Table 3).

**Support.** All participants described the positive influence of support on both their physical and/or mental recovery. Sixteen out of 21 participants reported that their parents played a positive role in their recovery. Parents were found to provide the most positive form of support; providing transportation, mental health check-ins, and being empathetic. However, 28% of participants described stress, due to their parents' lack of concussion knowledge:

*So, they [my parents] were really always there for me and so was my brother. So, it was good on the home front, because I always had somebody I could talk to somebody I could turn to, everything like that (Participant #4).*

Participants also reported positive support from their siblings (9%), peers (33%) and teammates (38%). While 9% of individuals mentioned that they did not feel supported by their school, 43% of individuals touched on the positive support they received from their teachers, principals or anyone within the school system in regard to the need for time off, exemption from examinations, or academic accommodations.

**Previous concussions.** Sixty-seven percent of individuals who participated in the interviews had experienced more than one concussion. Three individuals mentioned that their previous concussions had a negative impact on their recovery, related to the frustration of having another injury and/or knowing the complicated recovery that was to come. However, five participants mentioned that having had previous concussions was helpful in that they were familiar with the potential symptoms and the recovery process:

*I think it really helped with seeing how that one [concussion] was a pretty serious one and how with the steps that we took, I did get out of it. And now with my mindset, while it [the experience] was still crummy, my mindset to successfully recovering was a lot better. I didn't experience as much emotional and mental negative effects (Participant #10).*

**Prioritizing mental health.** Although prioritizing mental health above physical health during recovery was not a common subtheme, participants who spoke about it, emphasized it throughout their responses (i.e., 4 participants). They described a point in their physical recovery where their mental health was compromised, and there was a deliberate decision to compromise their physical recovery plan, in order to optimize their mental health.

**Table 3.** Frequency Chart Domain 2: Coping with Acute Challenges Post-Concussion

Coping with Acute Challenges Post-Concussion	Participants who Spoke about Theme		Overall Number of Times Theme was Mentioned
	Number (n)	Percentage (%)	
<b>Support</b>	21	100%	115
Parental Support Positive Impact on Recovery	16	76%	21
General Support Positive Impact on Recovery	10	48%	16
School Support Positive Impact on Recovery	9	43%	16
Support from Teammates Positive Impact on Recovery	8	38%	8
Peer Support Positive Impact on Recovery	7	33%	9
Stress Caused by Lack of Parental Knowledge on Concussions	6	29%	8
Health Care Professional Support Positive Impact on Recovery	5	24%	13
Coach Support Positive Impact on Recovery	5	24%	6
Health Care Professional Support Negative Impact on Recovery	2	9%	6
School Support Negative Impact on Recovery	2	9%	3
Sibling Support Positive Impact on Recovery	2	9%	2
Peer Support Negative Impact on Recovery	2	9%	2
Parental Support Negative Impact on Recovery	1	5%	2
Mental Health Professional Support Positive Impact on Recovery	1	5%	1
Coach Support Negative Impact on Recovery	1	5%	1
Support from Teammates Negative Impact on Recovery	1	5%	1
<b>Previous Concussions</b>	6	29%	20
Previous Concussion had a Positive Impact on Subsequent Recoveries	5	24%	11
Previous Concussion had a Negative Impact on Subsequent Recoveries	3	14%	9
<b>Prioritizing Mental Health</b>	4	19%	8
Put Mental Health Before Physical Health	4	19%	8

### Domain 3: Take-Aways Post-Concussion

Athletes touched on different concepts that they had learned from their experiences and the impacts on various aspects of their life (Table 4).

**Long lasting impact on mental and physical health.** Thirty-eight percent of athletes reported a long-lasting change in their mental health post-concussion, describing this as the most difficult aspect of the recovery process. One third of participants also touched on the impact of long-lasting symptoms including: headaches, dizziness, memory impairment, hormonal disruption, etc.:

*There is definitely a nervousness I would say anytime you go out, you can get. I would call it an inner anxiety, like a subconscious anxiety, like it's not self-consciously happening, its completely in the back of my mind (Participant #21).*

**Learning about injury post-concussion.** The majority of participants spoke about the opportunity to learn more about health and injuries after experiencing their concussion. Seventy-six percent of participants described an increased cautiousness about preventing future injuries, with 43% believing that they returned to sports too soon, and 29% believing they should have been more careful.

**Self-growth post-concussion.** Participants commonly spoke about different forms of self-growth and how the challenges helped determine the person they are today. Forty-three percent of participants described a process of re-evaluation of what was important to them. Just over half of the participants described developing more resilience. One participant noted: "It kind of showed me that I don't exactly need it [hockey] to be who I am exactly (Participant #18)".

**Table 4.** Frequency Chart Domain 3: Take-Aways Post-Concussion

Take-Aways Post-Concussion	Participants who Spoke about Theme		Overall Number of Times Theme was Mentioned
	Number (n)	Percentage (%)	
<b>Long Lasting Impact on Overall Health</b>	14	67%	35
Long-Lasting Self-Reported Impact on Mental Health	8	38%	16
Permanent Physical Change Post-Concussion	7	33%	10
Personal Belief that Mental Health Challenges came from Concussion	6	29%	9
<b>Learning about Injury Post-Concussion</b>	19	90%	63
Increase Cautiousness about Preventing Future Injury	16	76%	27
Retrospective Belief that they Returned too Soon	9	43%	15
Concussion caused Greater Appreciation of Brain Health	6	29%	13
Retrospective Belief that they Should have been more Careful	6	29%	8
<b>Self-Growth Post-Concussion</b>	15	71%	32
Current Personal Resilience due to Concussion Challenges	11	52%	22
Re-evaluating what's of Importance in Personal Life	9	43%	10

## Discussion

### Isolation

Research on adult athletes has found that frustration over uncertain recovery time, isolation from teammates and sports, and a lack of social support, results in emotional responses following SRC (Kontos et al., 2016). These findings closely resemble the identified challenges and adversities reported by adolescent athletes in our study, specifically, the feelings of missing out and isolation. Similar to the findings of Kontos et al. (2016), the participants in the current study noted frustrations about the uncertainties of recovery, including types of symptoms, lack of ability to see progress, and the duration of recovery. Participants mentioned feelings of isolation, difficulty with unknowns, and feelings of helplessness. Within the theme of feelings of isolation, participants often talked about loneliness. Multiple previous studies in both adults and children found that athletes experience feelings of isolation and loneliness post-concussion (Andrews et al., 1998; Davies et al., 2020; Kontos et al., 2016; Valovich McLeod et al., 2017; Weinberg & Gould, 2014). It is critical that adolescents are provided with the support they need, both from an educational perspective to ensure they have knowledge about what a concussion entails, but also in a companionate matter. During this time of isolation, for adolescents, it is critical that they have outlets of support to confide in, and communicate with, since the current study identifies support as a protective factor that fuels resiliency.

## Support

As such, it is critical that children remain connected to peers, friends, and teammates throughout the concussion recovery (Reed et al., 2019). In the current study, participants frequently spoke about various supports that were beneficial to their recovery. This is consistent with the findings of Davies et al. (2020) who found that support from home can be an ameliorating factor.

However, some participants acknowledged stress, at times, as a result of their parents' lack of knowledge regarding concussions. Iadevaia et al. (2015) found that certain social relations had a negative impact on participants' mental health, reporting that children ages 12-16 struggled with a lack of support from teammates and confrontational relationships within their family. This is consistent with Engström et al. (2020) who found that athletes did not receive effective advice or support from the team leaders, including from coaches. Weber Rawlins et al. (2021) emphasizes the importance of both coaches, and the team dynamic, in having a powerful impact on a child's experience post-concussion, highlighting that these supports can have both a positive or negative impact, depending on their approach and perception of the severity of the concussions.

The contradictory findings in the literature, may be explained by Cover et al. (2018), who discovered that if there is any indifference in the child's support system post-concussion, this can cause frustration. The current study, along with previous literature, has found that having individuals around you who did not understand your experience often made things worse (Davies et al., 2020). Additionally, the current findings are supported by Engström et al. (2020), who found that a lack of understanding from others, and the invisibility of their injuries made things challenging. Therefore, the current results, in combination with previous literature, suggest that the child's support system can be supportive of a positive mental recovery, however, if the child does not feel understood, or perceives indifference in their support system, this can act as a barrier. The current findings suggest that positive parental and peer support can aid in children's resiliency as they recovery post-concussion.

## Uncertainty

Another challenge identified in the current study, as well as by Kontos et al. (2016), was uncertainty in recovery. Along with uncertainty, helplessness was also identified as a common emotional reaction post-concussion. These findings are similar to those of Davies et al. (2020), who found increases in feelings of sadness and even irritability in youth. Valovich McLeod et al. (2017) also identified feelings of frustration post-concussion, which may be related to the uncertainty of recovery time.

## School

The challenges with school mentioned in the current study, as well as the perceptions of lower academic achievement reported by Rieger et al. (2019), appeared to be a tremendous barrier for children throughout recovery. This was also found by Stazyk et al. (2017), who reported that 53% of children ages 7-18 who suffered from a concussion reported a decrease in school performance. Additionally, Valovich McLeod et al. (2017) emphasized the difficulties encountered at school, specifically symptoms causing grades to drop, or impacting children's ability to complete assignments. Similar to the current findings, Valovich McLeod et al. (2017) reported inconsistencies across individuals in regard to academic adjustments post-concussion. Findings from Davies et al. (2020), suggest that coordinated academic adjustments at school could help to alleviate stress and, therefore, are critical in better supporting children as they return to school.

## Self-Image and Identity

Rieger et al. (2019) reported perceptions of lower expectations, however, this was not reported by participants in the current study. However, lower personal expectations may be the result of changes in self-image and mattering that was described in the current study. These findings support previous research that has found that self-image is impacted in adults (Caplan et al., 2016), adolescents (Snyder, 2019), and children (Hendry et al., 2020; Iadevaia et al., 2015; Todd et al., 2018) post-concussion. Similar to the impact on mattering observed in the current study, Valovich McLeod et al. (2017) found that athletes demonstrated significant concern for letting their team and family down, and not being able to fulfill their role as an athlete.

Consistent with the current findings, Todd et al. (2018) found that athletes are often trying to form a new identity post-concussion as they struggle with their self-image. They also found that participants' "athletic identity" was disrupted. Specifically, athletic identity is how an individual identifies with their athletic role (Brewer et al., 1993). This is

also supported by Cover et al. (2018), who found that athletes struggled with their athletic identity post-concussion. In the current study, few participants spoke about their self-image in relation to their athletic identity. Interestingly, out of the four individuals who touched on athletic identity, three of them were hockey players. This novel finding suggests that perhaps the culture displayed in the sport of hockey encourages a stronger athletic identity than other sports. In a study by Engström et al., (2020), who interviewed hockey players who had experienced concussions and, therefore, stopped playing hockey, participants discussed how they lost their identity and had to rebuild who they were. The findings from Engström et al. (2020) and Todd et al. (2018), along with the current findings, suggest that it is important that children and adolescents are provided with the means to rebuild their identity throughout recovery, in order to help build feelings of resiliency and strength. This could be accomplished through utilizing peer relations, positive support from family and friends, and perhaps intervention and support in rebuilding self-identity.

### **Prioritizing Mental Health**

The decision for athletes to make their mental health the priority in their recovery was another factor that was found to have a positive impact on participants' emotional and mental health post-concussion. Many spoke about how their mental health interfered with their ability to follow their rehabilitation protocol, which often focused on rest and isolation. This suggests that traditional concussion management may negatively impact mental health. In fact, there is limited evidence that complete rest achieves the goal of shortened recovery (Committee on Sports-Related Concussions in Youth et al., 2014). Long-term rest actually predisposes an individual to symptoms of fatigue, depression, physiological deconditioning, and delayed recovery (Thomas et al., 2015; Willer & Leddy, 2006), suggesting that perhaps active rehabilitation protocols may be more beneficial as they decrease recovery time (Plourde et al., 2018), and have the potential to improve mental health.

### **Growth and Opportunity for Learning**

Several themes were identified regarding what was learned by participants through the concussion recovery process. Participants acknowledged significant learning regarding brain injury, suggesting the need for improved preventative education strategies for athletes. Additionally, participants reported significant self-growth post-concussion, which is similar to the findings of Cover et al. (2018), who noted that concussed individuals seemed to elicit a strong sense of empathy for others who experienced concussions. Despite all of the challenges encountered during recovery, participants reported determination and a re-evaluation of life priorities. The latter finding suggests that these athletes portray resiliency as they strive to recover.

### **Limitations**

This is a retrospective study with recall limitations. Sampling time (i.e., time post-concussion) was also quite variable between participants. We acknowledge the potential for self-selection bias due to voluntary participation. The wide age range of participants makes generalizability challenging, and also makes it difficult to identify key developmental findings. Additionally, a large percentage of participants had sustained previous concussions and, therefore, it is difficult to isolate the impact of the most recent concussion, compared to the cumulative effect. Lastly, the primary researcher had existing relationships with some of the participants, which may have positively or negatively impacted their responses; this may act as both a strength and a limitation.

### **Conclusion**

The current exploratory study provides a framework of potential challenges that adolescent athletes may face post-concussion, as well as the coping mechanisms and the protective factors that are present throughout recovery. By gaining a unique perspective of adolescent athletes in a retrospective approach, the importance of both education and support throughout recovery has been identified. By integrating these factors to shape novel intervention and prevention strategies, it is hoped that improvements in mental health post-concussion in this population will be observed. In regard to preventative approaches, it is critical to educate parents and other supportive adults (teachers, coaches etc.) on both the medical impact of a concussion, as well as the challenges that athletes may experience post-concussion, in the hopes of decreasing both the uncertainty and indifference across support systems. Moving forward, further research is needed on the most effective way to raise awareness (Macdonald & Hauber, 2016), and educate adults, however, it has been found that one-time educational interventions are not enough (Kroshus et al., 2018). Therefore, perhaps providing parents with contextual information, including exemplars that personalize the knowledge for parents could be beneficial (Kroshus et al., 2018).

From an intervention perspective, intervention strategies that teach individuals to cope with feelings of isolation and missing out may help athletes to build characteristics needed for resiliency. This may be potentially achieved through the use of different forms of support, specifically parental. Concurrent parent and child interventions may allow for both education and skill teaching post-concussion, while also using techniques, such as mindfulness to improve mental health outcomes, as found to be successful in the general population (Xie et al., 2021). It is also important that parents are able to advocate for their children, in communicating with the child's peers, other family members, and teachers. By relieving the child of some of the burden of sharing their diagnosis with those around them, during a time where they are already facing challenges, parents can potentially alleviate some of those external pressures to increase well-being.

The results also highlight that the majority of athletes in this age group struggle when returning to school. It is extremely important that future research identifies how the academic environment can better support children with brain injury. The current study highlights the need for educators need to be provided with education around the identified challenges, in order to ensure they are creating an accommodating, consistent, and supportive environment that promotes athletes' well-being.

### Implications

This study provided the groundwork for identifying the emotional and mental experiences post-concussion, and highlighting potential protective factors and characteristics that allow children to overcome mental health adversities post-concussion. The current study highlights the salience of education and support in both preventative and intervention approaches, in order to fuel resiliency in children and adolescents, and decrease feelings of uncertainty, hopelessness, and improve self-image. This can be done by utilizing protective factors and educating caring adults (parents, teachers, coaches etc.), in order to better support children throughout recovery. It is critical that throughout the rehabilitation process, mental health is an area of focus, along with physical health, in order to allow child and adolescent athletes to fully recover post-concussion.

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The authors have no conflict of interest to disclose.

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